

Status Report:

*Western Snowy Plovers and
Recent Changes in Human and Dog Use within the
Snowy Plover Management Area at Ocean Beach
and the Wildlife Protection Area
at Crissy Field*

National Park Service
Golden Gate National Recreation Area

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Introduction

The purpose of this report is to determine whether off-leash dogs are harassing or detrimentally affecting western snowy plovers (*Charadrius alexandrinus nivosus*) at Ocean Beach and Crissy Field within Golden Gate National Recreation Area (GGNRA), and, if such behavior is occurring, to recommend measures to mitigate impacts to snowy plovers. These two park locations within San Francisco, the Ocean Beach Snowy Plover Protection Area (SPPA) and the Crissy Field Wildlife Protection Area (WPA), support overwintering populations of the snowy plover from approximately July through the beginning of May each year. See Figures 1 and 2.

The western snowy plover was listed as a threatened species under the federal Endangered Species Act (ESA) in 1993 due to loss of habitat by encroachment of non-native vegetation, predation, disturbance from recreational use of beaches, and development. The plover's threatened status affords it protection from harassment, defined under the ESA as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering."

The 2006 National Park Service Management Policies (NPS 2006) provide guidance to the NPS for the management of threatened and endangered species. Section 4.4.2.3 states that "The Service will survey for, protect, and strive to recover all species native to national park system units that are listed under the Endangered Species Act. The Service will fully meet its obligations under the NPS Organic Act and the Endangered Species Act to both proactively conserve listed species and prevent detrimental effects on these species."

From 1997 until December 2004, dogs were required to be leashed within the Ocean Beach SPPA, and dogs were prohibited within the Crissy Field WPA, as recommended in existing GGNRA management plans.¹ The rulings in U.S. v. Barley (U.S. District Court of Northern California) allowed unleashed dogs in certain areas of the park including areas where snowy plovers are seasonally present. Since the court rulings, park visitors have been allowed to walk their dogs off-leash in these two areas.

Snowy plovers utilize overwintering habitat for feeding and resting to accumulate energy reserves necessary for successful breeding. Dogs, as domesticated predators, instinctively use their well-developed senses to locate other animals out of curiosity or in search of prey. Snowy plovers naturally perceive dogs as a significant threat and frequently respond by running or taking flight to move out of harms way. Such disturbances at overwintering sites require an increase in energy expenditure that may adversely impact individual survival and reproductive success, thereby affecting the species at the population level (U.S. Fish and Wildlife Service 1997).

¹ The Draft Snowy Plover Management Plan (GGNRA 1998a) recommended dogs be on-leash in the snowy plover area at Ocean Beach from Stairwell 21 to Sloat Boulevard. Enforcement of the leash regulation began in 1997. The Environmental Assessment for the Crissy Field Plan (GGNRA 1996) established a Waterbird Protection Area, excluding dogs from the beach in the vicinity of the former Coast Guard Station to provide habitat for shorebirds and waterbirds. The 'Waterbird Protection Area' was later formalized as the 'Wildlife Protection Area.'

This report analyzes newly available data since the Barley rulings. The data demonstrates an increase in the number of unleashed dogs in the Ocean Beach SPPA and the Crissy Field WPA, as well as an increase in incidents of off-leash dogs harassing and detrimentally impacting western snowy plovers and other shorebirds. The existing situation presents a serious threat to the western snowy plover. The present management regime of off-leash dog use is inadequate to protect the western snowy plover from harassment by off-leash dogs. Recommendations are provided to assist park management in meeting the goals of the ESA and NPS policy to protect the species.

The report is organized with a statement of objectives, followed by a description of the study area. Methods and results are then presented separately for Ocean Beach and Crissy Field, followed by discussion and conclusions, including recommendations, inclusive of both areas.

Objectives

The principal objective of the analyses presented in this report is to test the assumption that present management (i.e. off-leash dog use) following the Barley rulings is inadequate to protect the western snowy plover from harassment and other detrimental effects of chasing by dogs.

Secondary objectives are to:

- 1) Provide a brief summary of snowy plover monitoring programs at GGNRA, as well as snowy plover use patterns at Ocean Beach and at the Crissy Field WPA.
- 2) Evaluate whether patterns of use by people and dogs have changed since the Barley rulings and how these changes may be affecting snowy plovers at Ocean Beach and at Crissy Field.
- 3) Recommend actions to adequately protect western snowy plovers in the park.

Study Areas

The study areas for this report encompasses the beach in the Snowy Plover Protection Area at Ocean Beach, extending from Stairwell #21 across from Golden Gate Park in the north, south to Sloat Boulevard, and including the tidelands managed by GGNRA (Figure 1). The Crissy Field Wildlife Protection Area encompasses the area from the Fort Point Mine Depot (a.k.a. Torpedo Wharf) eastward to the concrete riprap approximately 700 feet east of the former Coast Guard Station. In the north – south direction, the WPA extends north from the northern border of the Promenade (not including the fenced restored dunes and the developed area) and includes the tidelands to 100 yards off shore (Figure 2).



Figure 1. Snowy Plover Protection Area at Ocean Beach, San Francisco



Figure 2. Wildlife Protection Area at Crissy Field, San Francisco

Ocean Beach Snowy Plover Protection Area

Methods

Snowy plovers have been monitored on Ocean Beach using standard protocols since December 1994 (Stenzel et al. 1995). Surveys are typically conducted on one weekday and one Saturday every two weeks (depending upon weather and availability of trained staff and volunteers), from July until May, or until plovers are no longer observed on the beach for a two week period. Trained observers walk 3.7 miles of beach from the Cliff House in the north to the start of the bank swallow cliffs at Fort Funston in the south (Figure 1). This length of beach is divided into 14 sectors. During each survey, observers record the following data for each sector:

- the amount of time spent in the sector so that encounter rates can be calculated
- the number of snowy plovers, and whether they are foraging or not, as well as their location on the beach, and beach substrate conditions
- the number of people
- the number of dogs, tallied by whether dogs are on-leash, off-leash within 6 feet of their owner, roaming (where dogs are observed more than 6 feet from their owner), chasing shorebirds, or chasing plovers (the number of plovers that were disturbed also is recorded). Dogs are only counted once in the category of greatest potential for disturbance it exhibits (e.g. if a dog is counted as leashed and its owner removes the leash, the dog's status is changed to unleashed)
- the number of equestrians
- the number of vehicles
- the number of raptors, including their behavior (perched, flying, attacking birds, or attacking plovers)
- the number of aircraft, helicopters, and kites flying within 1,000 feet of the beach
- weather and tides at the start of the survey

A survey year is considered to be the entire overwintering period during which snowy plovers are present in the park, which extends from early July through early May as follows:

2004 survey year – July 2004 to May 2005

2005 survey year – July 2005 to May 2006

2006 survey year – July 2006 to May 2007

Two approaches were utilized to analyze the data from Ocean Beach. The first was to compare data from the 2004 survey year to data for the 2005 survey year. Analysis of Variance (ANOVA) is a statistical procedure used to test for significant effects on dependent variables by examining the hypothesis that all groups have the same mean for the dependent variable (Zar 1996). Single-factor ANOVA analysis (MS Excel 2004) was used to test for differences in mean values of dependent variables related to dog use in the SPPA at Ocean Beach between years for 2004 and 2005. Figures used to illustrate significant results include error bars equal to one standard deviation (a statistical measure of spread or variation in the data).

The second approach was to examine patterns of snowy plover abundance, and human and dog use and behavior within the SPPA for the 2000 through 2005 survey years through graphical analysis, where interdependent phenomenon are studied by analyzing graphical representations

of the data. Most graphical depictions of data are presented as median values, or the number that has the same number of values above it as below it. The median is a better estimate of the data's central tendency as it is not skewed by unusually large or small values or outliers.

Results – Ocean Beach

From 2000-2005, a total of 184 snowy plover surveys were completed on Ocean Beach, with an average of 31 surveys per year. A total of 355 hours were spent on Ocean Beach during these 184 surveys (average of 59 survey hours per year). A total of 92 hours (average 15 hours/year) was spent by observers within sectors of the beach in which snowy plovers were observed. This amount of time is the window in which observers can actually observe potential impacts to snowy plovers. The surveys represent a snapshot in time from which one could extrapolate and infer that this behavior is occurring more frequently than is actually observed. In order to standardize comparisons across surveys, most variables are presented in per hour rates. One would need to extrapolate from these data and factor in other variables to estimate daily, seasonal, or annual totals.

Based on monitoring conducted since the mid-1990s, snowy plovers use Ocean Beach for “overwintering” (non-breeding), tending to arrive starting in July, with plover numbers peaking in October or November, and remaining high and relatively consistent through the winter months, November through February. After February, plover numbers begin to decline through April or May, when plover numbers usually drop to zero at Ocean Beach (GGNRA 2006b, GGNRA 1998a). See Table 1. Although snowy plovers were often seen on the first and last complete survey dates, park staff conducted targeted surveys specifically to locate snowy plovers (without recording human and dog use) after the last complete survey date and before the first complete survey date, based on park management needs.

Table 1. First and Last Dates Snowy Plovers Were Observed at Ocean Beach and Snowy Plover Numbers on Those Dates

Survey Year	Date of First Complete Survey	First Date Plovers Observed / # of Plovers	Date of Last Complete Survey	Last Date Plovers Observed / # of Plovers
2000	7/05/2000	7/09/2000 2 plovers	4/11/2001	4/11/2001 9 plovers
2001	7/12/2001	7/25/2001 11 plovers	4/06/2001	3/30/2002 12 plovers
2002	7/24/2002	7/24/2002 8 plovers	5/21/2003	5/07/2003 2 plovers
2003	7/30/2003	7/30/2003 10 plovers	5/15/2004	4/28/2004 4 plovers
2004	7/28/2004	7/28/2004 16 plovers	5/25/2005	4/30/2005 4 plovers
2005	8/10/2005	08/10/2005 20 plovers	4/19/2006	4/19/2006 6 plovers

Winter season data is used to examine average or median plover counts because this is the period with the most consistent use of Ocean Beach by snowy plovers. Maximum annual single survey counts of snowy plovers from 2000-2005 ranged from a low of 23 in 2000 to a high of 62 in 2003 (Figure 3). Median plover counts per survey ranged from 14 in 2000 to a high of 36 in 2003. Median snowy plover numbers in winter increased from 2000-2002 and then leveled off at around 35 plovers through 2005, however plover numbers have still not matched those recorded in 1994 when a maximum of 85 snowy plovers and an average of 56 plovers were recorded (Hatch 1996, GGNRA 2006b).

Snowy plovers have displayed a preference for certain areas of Ocean Beach for as long as they have been known to occur there, with the highest numbers occurring between Noriega and Rivera Streets, and between Lincoln Way and Lawton Street. The highest density of plovers appears to shift between these two locations from year to year, but with both areas used every year by at least some plovers. A small number of plovers have been observed between Taraval St. and Sloat Blvd., and between Lincoln and Stairwell #21. These last two areas were included in the original Snowy Plover Protection Area on Ocean Beach in 1995 to serve as effective buffers between off-leash dogs and the areas with the highest concentrations of snowy plovers.

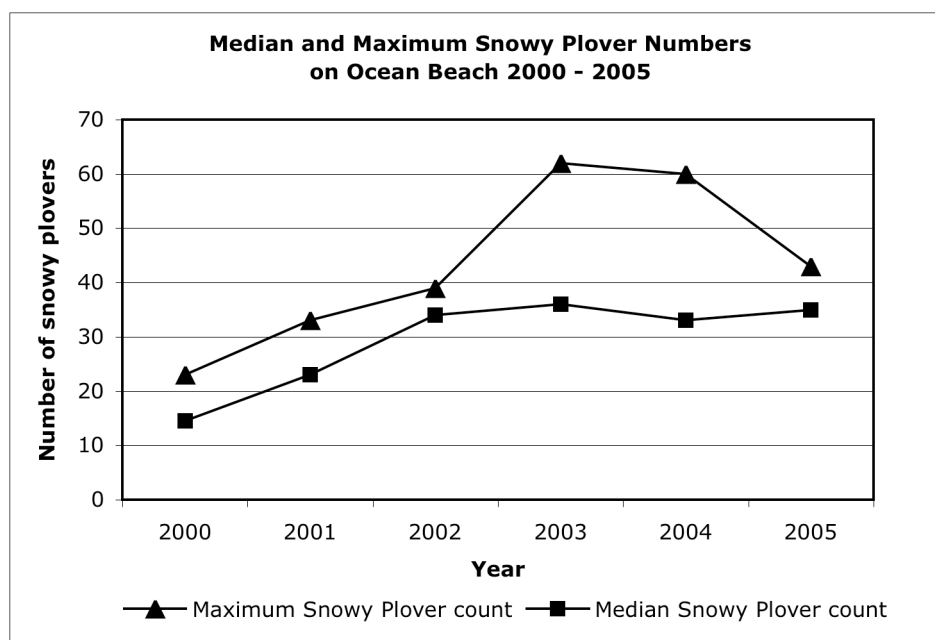


Figure 3. Median and Maximum Snowy Plover Numbers at Ocean Beach 2000 - 2005

One of the objectives of this analysis is to determine how patterns of human and dog use and behavior have changed since the Barley rulings, and to understand how this might be affecting snowy plovers. Figure 4 illustrates that the median number of dogs observed per hour in the Ocean Beach SPPA increased substantially in 2005, and that 75% to 80% of these dogs were unleashed. The median number of dogs per hour in the SPPA showed a significant increase from 2004 to 2005 on weekdays ($df=1$, $F=2.99$, $P<0.10$), as well as on weekends ($df=1$, $F=7.74$, $P<0.02$). There was an increase from 7.5 dogs per hour in 2004 to 10.1 dogs per hour in 2005 on weekdays, and an increase on weekends from 14.2 dogs per hour in 2004 to 27.8 dogs per hour in 2005. Separate weekend and weekday analyses were needed due to these large

differences in use of the beach on weekdays versus weekends. The weekend analysis is shown in Figure 5, where the error bars equal one standard deviation.

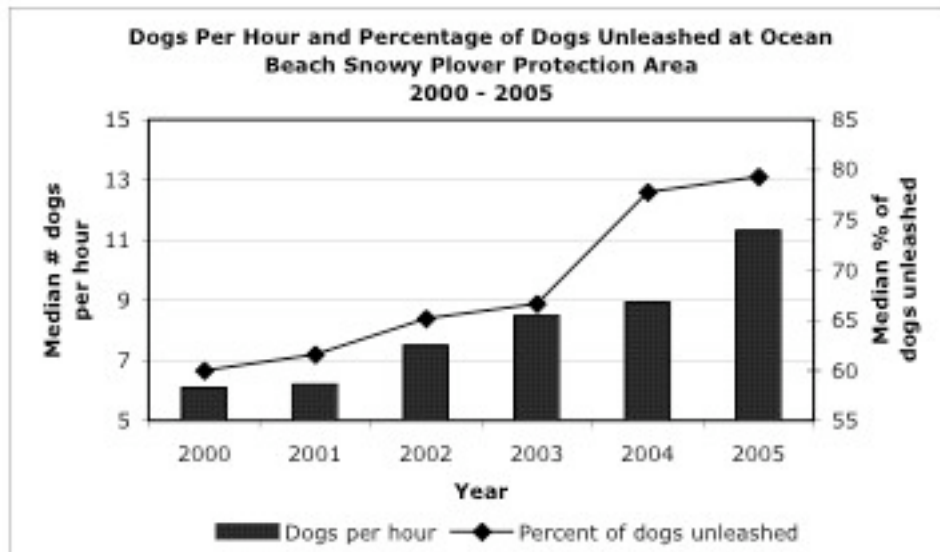


Figure 4. Median Number of Dogs Per Hour and Percentage of Dogs Unleashed at the Ocean Beach SPPA, 2000 – 2005 (includes weekdays and weekends)

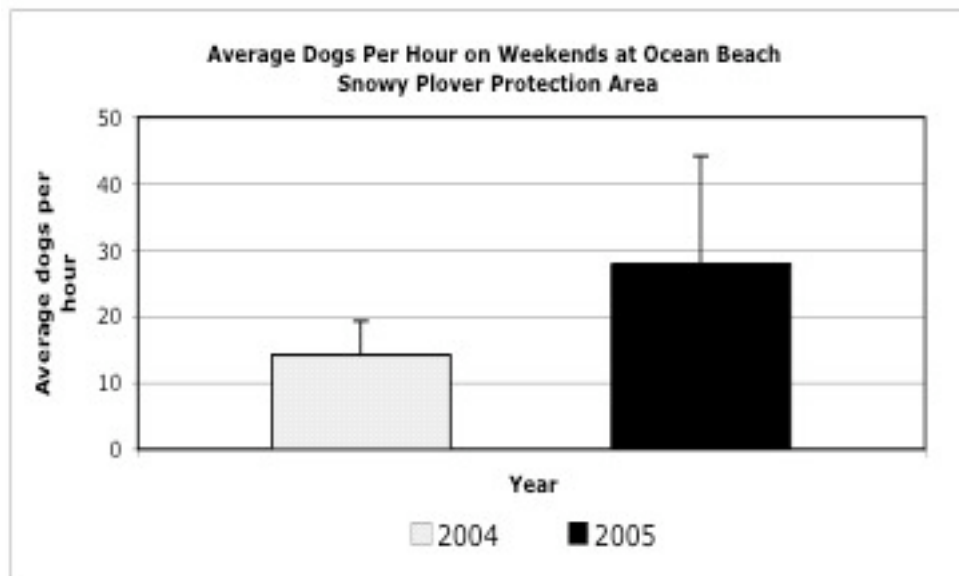


Figure 5. Average Number of Dogs Per Hour on Weekends at Ocean Beach SPPA, 2004 and 2005

Ocean Beach survey data from 2000 through 2005 also show that while the median number of people per hour (weekdays and weekends combined) did not increase, the median number of dogs per person increased dramatically in the 2005 survey year (Figure 6), indicating that people with dogs were bringing more dogs to the SPPA. Fewer weekend surveys were conducted in

2005, which likely explains the slight decline in people per hour in 2005 (since more people are encountered on weekend surveys). The median number of dogs per person in the SPPA was significantly greater in 2005 than in 2004, both on weekdays ($df=1$, $F=3.19$, $P<0.09$), and on weekends ($df=1$, $F=5.16$, $P<0.04$) (Figure 7).

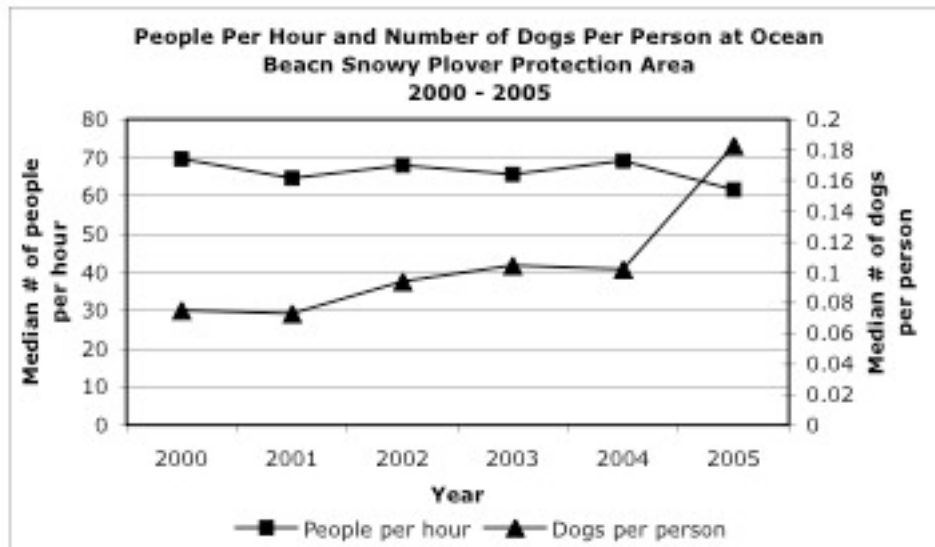


Figure 6. Median Number of People Per Hour and Median Number of Dogs Per Person at the Ocean Beach SPPA, 2000 – 2005 (includes weekdays and weekends)

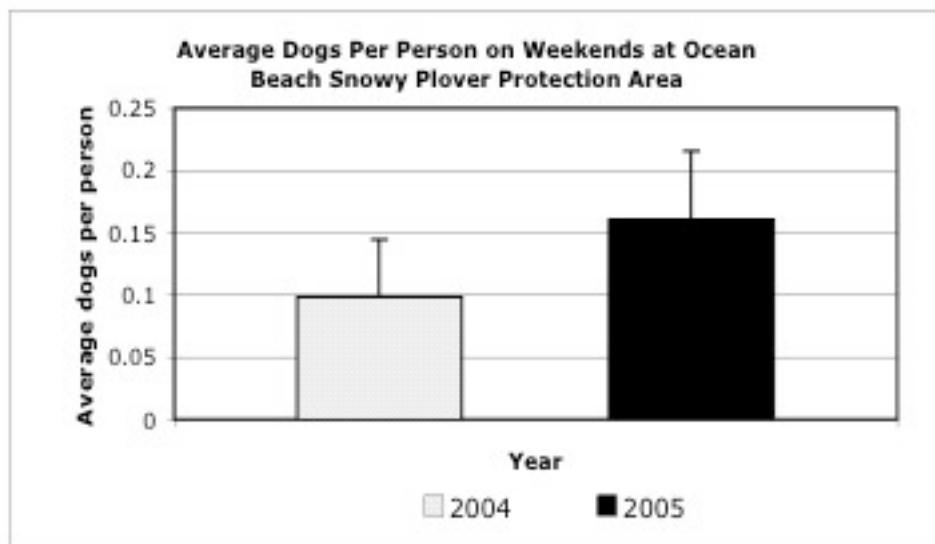


Figure 7. Average Number of Dogs Per Person on Weekends at the Ocean Beach SPPA, 2004 and 2005

With an increase in the number of dogs per hour, there was also a significant increase in the average number of dogs per hour chasing shorebirds (other than snowy plovers) in the SPPA (Figures 8 and 9), again both on weekdays ($df=1$, $F=4.64$, $P<0.04$), and on weekends ($df=1$, $F=6.75$, $P<0.03$). The average number of dogs per hour observed chasing shorebirds jumped

from 0.14 in 2004 to 0.48 in 2005 on weekdays, and from 0.33 in 2004 to 1.92 in 2005 on weekends.

Snowy plovers also experienced a significant increase in the average number of dogs chasing them in survey year 2005 as compared to 2004 ($df=1$, $F=4.36$, $P<0.05$). All survey observations of dogs chasing snowy plovers from the 2000 through 2005 survey years occurred in the 2005 survey year. Dogs were observed chasing plovers on 4 occasions, disturbing a total of 22 snowy plovers, in February and March of 2006. No dogs were observed chasing plovers in the 2004 survey year.

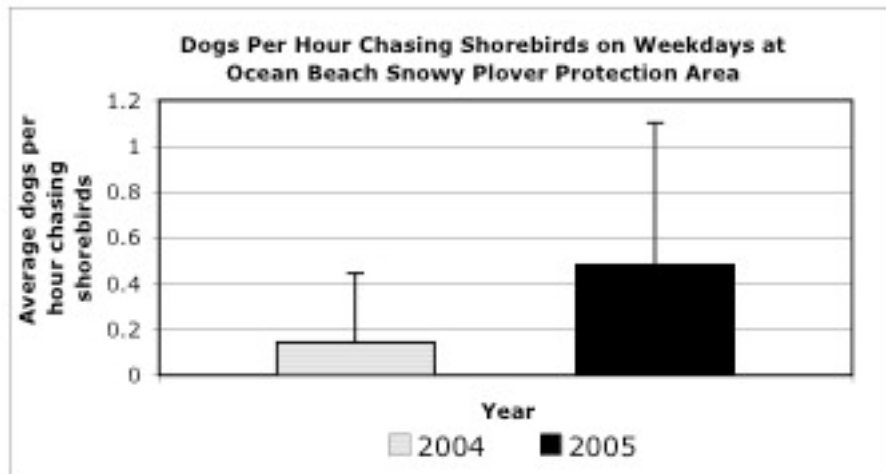


Figure 8. Average Number of Dogs Per Hour Chasing Shorebirds on Weekdays at the Ocean Beach SPPA, 2004 and 2005

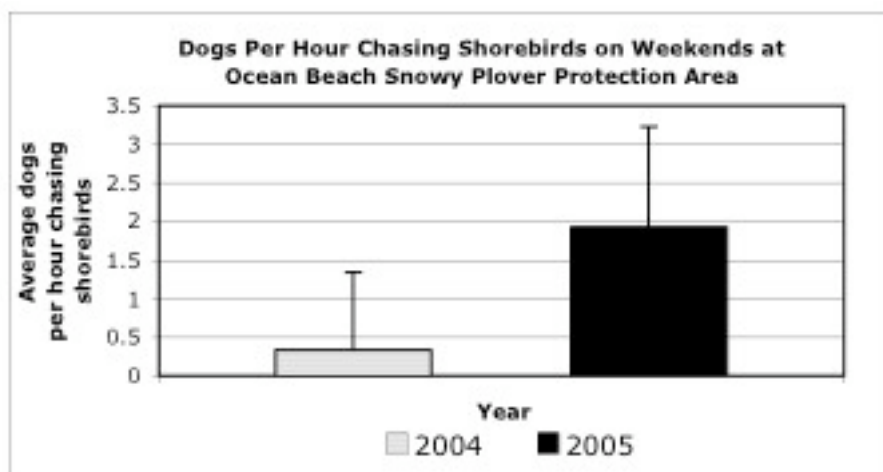


Figure 9. Average Number of Dogs Per Hour Chasing Shorebirds on Weekends at the Ocean Beach SPPA, 2004 and 2005

A further look at the observed incidents of dogs chasing shorebirds (other than snowy plovers) again shows the disproportionate increase in this behavior in the 2005 survey year as compared

to the observed rate of dogs chasing birds for the entire period from 2000 through 2005. The observed rate over all years is what would be expected in each year if conditions remained constant. Table 2 shows the observed and expected values for 2004 and 2005. There was a 125% increase in the observed number of dogs chasing shorebirds during surveys in 2005 as compared to what was observed from 2000 through 2005. In addition, the percentage of these events taking place within the Snowy Plover Protection Area (79%) greatly exceeds the expected value of 58% observed from 2000 – 2005. The fact that so many of the incidents of dogs chasing shorebirds are taking place in the same area where snowy plovers occur puts them at greater risk of being chased or disturbed as well. Since other shorebirds occur in higher numbers than snowy plovers, there is more data available to analyze these incidents than there is with respect to dogs chasing snowy plovers.

Table 2. Observed and Expected Numbers of Dogs Chasing Shorebirds during Snowy Plover Surveys at Ocean Beach, 2000 – 2005 ²

<i>Year</i>	<i># Surveys</i>	<i>Observed or Expected Values</i>	<i>Surveys with Dogs Chasing Birds</i>	<i>Number of Dogs Chasing Birds During Surveys</i>	<i>Percentage in Snowy Plover Protection Area</i>
2000 - 2005	183	Observed	67 (37%)	108 (59%)	58%
2004	33	Observed	12 (36%)	16 (49%)	50%
2004	33	Expected	12.1 (37%)	19.5 (59%)	58%
2005	20	Observed	14 (70%)	25 (125%)	79%
2005	20	Expected	7.3 (37%)	11.8 (59%)	58%

² Table 2. Example calculation of observed and expected values. The 2004 observed value of ‘Surveys with Dogs Chasing Birds’ is the actual number of surveys in 2004 where that behavior was observed (12). The observed percentage equals the number of surveys where the behavior was observed, divided by the total number of surveys in 2004 ($12 / 33 = 0.36$ or 36%). The expected values are those that would be observed if this behavior was constant over all the survey years (2000 – 2005). The expected number of surveys with dogs chasing birds in 2004 is calculated by multiplying the observed percentages in the first row (expressed as a proportion) by the total number of surveys in 2004 ($0.366 \times 33 = 12.08$).

Crissy Field Wildlife Protection Area

Methods

There are currently two different NPS monitoring programs within the WPA at Crissy Field. The beach and nearshore survey program monitors use of the beach by birds as well as by people and dogs. The other NPS program conducts targeted monitoring of the snowy plovers in the WPA. In addition, Golden Gate Audubon Society volunteers monitor the snowy plovers and associated disturbance within the WPA, and share their data and reports with the NPS.

The beach surveys were implemented after the Crissy Field wetland and dune restoration to document trends in bird species' use of the site over time and determine the value of newly restored habitats for resting, foraging and nesting. These surveys have been conducted since 2000. Beach and nearshore areas are surveyed twice in the same day at both high and low tide. Surveys were conducted about 2-4 days per month through September 2004 and occurred biweekly during peak migration and breeding windows, and weekly at other times. Beginning in October 2004, the frequency of surveys was reduced by one-half since several years of data had been collected and it was determined that fewer surveys could still detect the patterns of beach and nearshore bird use. Observers count all people and dogs across the beach habitat at Crissy Field, but do not separate data out for the WPA, although information on dogs in the WPA is noted in the comment field. Comment field information was used to compile WPA information presented in this report. Observers were instructed to record all instances of dogs chasing wildlife or interfering with normal wildlife behavior patterns.

Snowy plover monitoring started in February 2005 (in the 2004 survey year), after receiving several reports over the preceding months of snowy plovers in the WPA. (Prior to February 2005, snowy plovers were not known to use the WPA for overwintering, although they had been observed on a total of 4 surveys during the 2002 and 2003 survey years.) Trained monitors walked the beach for between 10 and 30 minutes looking specifically for plovers. The objectives of this monitoring were to track plover numbers and persistence within the WPA. Starting in the fall of 2005, monitors recorded any disturbances and their source on the beach, including dogs present on the beach in the WPA. In September 2006 the Ocean Beach snowy plover monitoring protocol was adapted for use at Crissy Field to make the two programs more comparable.

Lastly, Golden Gate Audubon volunteers monitored snowy plovers in the WPA from October 2005 to February 2006, and again when the plovers returned in July 2006. Observers watch the beach with a spotting scope to count plovers and determine any sources of disturbance to the plovers and other shorebirds. These surveys were not initiated until after the Barley rulings, but provide another indication of current patterns of plover and dog use in the WPA.

Data from the different sampling efforts are summarized and described in the accompanying tables and text. Specific information from individual surveys is reported where relevant. Survey years are the same as described for Ocean Beach.

Results – Crissy Field

Sporadic sightings of snowy plovers first occurred in the WPA during the 2002 and 2003 survey years when one or two plovers were observed. Based on NPS monitoring, up to 4 snowy plovers used the WPA during the 2004 survey year (GGNRA 2006a). As many as 6 plovers used the WPA during the 2005 survey year from Fall of 2005 through March of 2006. In August 2006 (the 2006 survey year), 4 snowy plovers were observed in the WPA. Several plovers with color bands have been observed in the WPA, two of which were observed in more than one survey year. Two of the color-banded plovers (a 2004 fledgling from Pismo Beach, and a 2003 fledgling from the Monterey Bay Aquarium) were observed in the WPA during the 2004, 2005 and 2006 survey years. This indicates a preference by some snowy plovers to return to overwinter at Crissy Field.

As shown by the NPS beach surveys presented in Table 3, dog use of the WPA has increased since the Barley rulings were issued and the public became increasingly aware that off-leash dog walking was permitted at Crissy Field (GGNRA 2006a). No dogs were noted in the WPA from June 2004 to May 2005. 29 dogs were observed in the WPA from June 2005 to May 2006. In just two months of the 2006 overwintering season, 22 dogs were observed in the WPA. No dogs were noted chasing wildlife during the 2005 survey year. However, in only 8 surveys from June through July 2006, there were 2 instances of dogs chasing birds, with dogs observed in the WPA on 75% of the surveys. The total number of dogs recorded in the WPA during beach surveys has increased over the past two years.

Table 3. Summary of NPS beach surveys in relation to dogs documented in the Crissy Field WPA

	<i>June 2000 to May 2004</i>	<i>June 2004 to May 2005</i>	<i>June 2005 to May 2006</i>	<i>June 2006 to July 2006</i>
Total # of bird surveys conducted	229 (average per year = 57)	25	31	8
# of surveys with dogs noted on beach (in and out of WPA)	228 (average per year = 58)	25	31	8
Avg. # dogs per survey per year (in and out of WPA)	15.1	11.2	19.3	27.5
# of surveys with dogs noted in WPA	21 (average per year = 5)	0	8	6
Percent of surveys with dogs noted in WPA	11.9%	0	26%	75%
Total # of dogs in WPA (from Comments field)	36 (average per year = 9)	0	29	22
# of dogs chasing birds in beach area (from Comment field)	2	0	0	2 in WPA

Note: The frequency of surveys conducted was reduced by one-half beginning in October 2004.

Based on 22 snowy plover surveys conducted separately by NPS and Golden Gate Audubon (Zlatunich 2006) from November 2005 through March 2006, dogs were noted on 23% of surveys. At the start of the 2006 survey year (which will end in May 2007), snowy plovers were first observed in the WPA on July 25, 2006. Results of NPS and Golden Gate Audubon surveys conducted in July and August of 2006 are summarized in Table 4.

Table 4. Summary of July-Aug 2006 Snowy Plover Surveys in the Crissy WPA

<i>Survey Date</i>	<i>Who Conducted Survey</i>	<i>Number of Dogs – Leashed and Unleashed</i>	<i>Number of Birds Including Plovers Disturbed by Unleashed Dogs</i>
7/25/2006	Golden Gate Audubon Society	15 off-leash	1 Western gull flushed by 2 dogs
8/08/2006	Golden Gate Audubon Society	6 off-leash	1 snowy plover disturbed (alert posture – stood up and increased vigilance) by dog
8/15/2006	Golden Gate Audubon Society	16 off-leash, 1 on-leash	Snowy plovers flushed twice, and ran twice when disturbed by dogs, 3 other shorebirds flushed by dogs
8/22/2006	National Park Service	9 off-leash	4 feeding snowy plovers flushed by a dog

In summary, the data from surveys within the Crissy Field WPA indicate increasing dog use, including off-leash use, in addition to increasing harassment of snowy plovers, as well as increased disturbance to other shorebirds. Disturbances that cause snowy plovers to flush or run interrupt their normal patterns of feeding and resting, and require increased use of energy reserves needed for migration and breeding success.

Discussion and Recommendations

Analysis of monitoring data from the Ocean Beach SPPA and Crissy Field WPA demonstrate that there has been an increase in harassment and disturbance of snowy plovers by off-leash dogs. These detrimental effects have occurred since the U.S. v. Barley rulings were issued and the public became increasingly aware that off-leash dog use was allowed in these two areas. As described in additional detail below, chasing and flushing of plovers by dogs presents a serious threat to the plover

Since June 2005, trained observers at Ocean Beach have recorded 4 separate incidents of dogs chasing and harassing snowy plovers, with a total of 22 plovers disturbed. No incidents of dogs chasing snowy plovers were observed in the previous 5 years of monitoring. Monitoring data from the Ocean Beach SPPA also documents a significant increase in the number of dogs per person and in the number of dogs encountered per hour from 2004 to 2005, with over 75% of dogs unleashed.

Coincident with the increase in number of dogs per hour, there was also a significant increase in the number of dogs per hour chasing shorebirds in 2005, with dogs observed chasing shorebirds on 70% of surveys. Shorebirds (other than snowy plovers) are usually present in much higher numbers than plovers, resulting in more recorded observations of dogs chasing shorebirds; however, these events represent the pattern underlying the concern for snowy plovers. Snowy plovers often intermingle with other shorebirds, and since shorebirds (including snowy plovers) tend to congregate in flocks, more than one bird is often disturbed when chased by dogs.

Observations at Crissy Field also indicate an increase in dog use, including off-leash dogs, within the WPA (the WPA was previously closed to dogs), since the Barley rulings, with snowy plover disturbances documented there as well. In June and July 2006, NPS observers recorded 22 dogs in the WPA, including 2 chasing birds, with dogs observed on 75% of surveys. Snowy plovers in the WPA were disturbed by dogs during 3 surveys in August 2006.

These data and other studies indicate a high potential for off-leash dogs to disturb snowy plovers and other shorebirds. Lafferty (2001b) found that off-leash dogs were a disproportionate source of disturbance to overwintering snowy plovers in Santa Barbara. A higher proportion of dogs than humans disturbed plovers, and at any particular distance, dogs had a higher probability of disturbing plovers than did humans. In a different study, Lafferty (2001a) found that 39% of dogs disturbed shorebirds compared to 10% of humans. At Ocean Beach, observational data of groups of snowy plovers collected in 1995 and 1996 indicated that people with dogs were more likely to disturb snowy plovers than people without dogs, and that snowy plovers were more likely to run or fly from people with dogs compared to people without dogs (GGNRA 1998b). Snowy plovers are also more susceptible to predation by peregrine falcons and other avian predators when disturbed, as they are more visible to avian predators when running or flying.

Other activities within the park that likely have some affect on snowy plovers include vehicle use for Beach Patrols on Ocean Beach, equestrian use of the beach, people walking or jogging in close proximity to plovers, flying kites (which may be perceived as avian predators), trash left on

the beach that may attract predators, and removal of kelp or driftwood that provides foraging habitat for plovers. However, the research cited above supports the argument that snowy plovers respond differently and more intensely to unleashed dogs, which they perceive as predators, than to these other sources of disturbance. In addition, the actions of unleashed dogs are often targeted directly at plovers and other shorebirds, unlike other beach activities.

Western snowy plovers have very specific feeding requirements associated with the coastal dune ecosystem. Studies of color-banded plovers, including those at Ocean Beach (Hatch 1996) and Crissy Field, document the preference of some birds to return to the same beach year after year. Because of their site fidelity and narrow habitat requirements they have few alternative roosting sites. This limits their abundance and makes them vulnerable to habitat loss and disturbance. The population decline over the past thirty years prompted the listing in 1993. The current population estimate for the listed Pacific Coast Distinct Population Segment of the western snowy plover is around 2,300 based on a survey in 2005 (Federal Register 2006), with the California estimate around 1,720. Recent maximum snowy plover numbers at GGNRA represented around 4% of the estimated total California population of plovers.

The following excerpts from a letter from the US Fish and Wildlife Service (1997) to the National Park Service (NPS) explains the effect that chasing or flushing by dogs has on snowy plovers, and why the emphasis with respect to harassment is on dogs rather than other common recreational activities at GGNRA:

...Dogs, however, are domesticated predators that instinctively utilize their well-developed sense of smell to locate other animals out of curiosity or in search of prey. Plovers naturally perceive dogs as a significant threat and respond by flying to a distant location out of harm's way. Dogs have been documented chasing plovers and other shorebirds great distances at Ocean Beach.

Ocean Beach is a key stop-over habitat which allows plovers to get enough nourishment and rest to continue their migratory journey. These habitat values are lost when unleashed dogs are allowed to flush and harass these small shorebirds...

...the individuals which continue to use the sites may abandon preferred habitat and spend more energy on vigilance and avoidance behaviors at the expense of foraging activity (Pfister et al. 1992; Burger 1993; Burger 1994). Non-visible effects of human presence on feeding and breeding behavior, such as physiological stress, can occur below the flight threshold. This decrease in the duration and intensity of foraging may result in decreased accumulation of energy reserves necessary to complete the migration cycle and successfully breed. Dog disturbance at wintering and staging sites, therefore, may adversely impact individual survivorship and fecundity, thereby affecting the species at the population level...

The results of the analyses presented in this report clearly indicate that the present management regime of off-leash dog use is inadequate to protect the western snowy plover from excessive disturbance and harassment at its overwintering sites within GGNRA.

Recommendations

The following measures are recommended to mitigate for the documented, adverse impacts that have occurred since the Barley rulings were issued and off-leash dog use in these areas increased:

- Require dogs to be leashed within the Ocean Beach SPPA and the Crissy Field WPA during the period when snowy plovers are present each year.
- Consult with USFWS under Section 7 of the Endangered Species Act regarding this action.
- Conduct snowy plover monitoring at each location using similar protocols and ensure that monitoring captures the arrival and departure of snowy plovers in the park each year.
- Conduct outreach efforts to educate park visitors, including dog-walkers and the general public, about the leash requirement and other steps they can take to protect snowy plovers and other wildlife.
- Enforce the requirement that dogs be on leash within the Ocean Beach SPPA and the Crissy Field WPA.

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